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BY FACSIMILE AND MAIL

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International Preliminary Examining Authority
European Patent Office
D-80298 Munich
Germany

Attention: Bunn, D.

Dear Sirs/Mesdames:

Re: PCT Patent Application No. PCT/CA2004/000577
Int'l Filing Date: April 19, 2004
Title: SWING BOOM PIVOT MECHANISM
Applicant: Silvatech Global Systems Ltd., et al.
Inventors: Gerald Dyck; Paul Dries; and Brent Snipstead
Priority: United States Patent Application no. 60/463,349 filed April 17, 2003
Our Ref: 2252-105

Regarding amendments made herein under Article 34, Claim 1 has been amended. Claims 3 and 4 have been cancelled. Claims 2 and 5-9 are unchanged and renumbered 3-7.

Comparing all of the amendments in present Claim 1 with the specification and drawings originally filed support is evidenced as follows:

(b) a lower pivot shaft (44) rotatably mounted on said fixed base;

This element is shown in Fig. 1, and on page 2, lines 14 and 17. The lower pivot shaft is said to pass through the lower spherical bearing with the outer race of the latter rigidly attached to the fixed base. This means that since the lower pivot shaft rotates with respect to its outer race, it rotates with respect to the fixed base.

(c) a pivot base (46) mounted on said lower pivot shaft (44) at a lower end thereof a distance from said fixed base (52) sufficient only to clear said fixed base during rotation;

The pivot base is shown in Figs. 5B, 6, 7 & 8 and on page 5, line 20 and on page 6, lines 1 and 6. Figs. 1 & 6 show a lower pivot shaft 44, fitted inside the lower spherical bearing 36 and the pivot base (22,46) mounted to the upper end of the lower pivot shaft. There is no support for the words (a distance from…..during rotation) and accordingly claim 1 has been amended to delete this phrase.

(d) a swivel actuator (38) coupled to said lower pivot shaft (44) and operative to drive said lower pivot shaft (44) in either of two rotational directions relative to said fixed base (52);

The swivel actuator is disclosed in Fig. 1 as well as on page 2, lines 5 and 9. It is said to control the amount of horizontal rotation of the pivot base 22 and boom 28 about the vertical axis. Applicant has amended this element to delete the words "..in either of two rotational directions.." and substitute therefor the words – horizontally through a selectable amount of rotation--. It is submitted that page 2 clearly supports the amended element (d).

(e) a boom (14) pivotally coupled to said pivot base (46) proximate a lower end thereof and having a hydraulic piston cylinder (58) coupled between said boom (14) and an upper end of said pivot base (46) and operative to raise and lower said boom (14);

The boom is disclosed in Figs. 5A, & 5B and on page 5, lines 12-19. Vertical pivotal movement of the boom relative to the pivot base is described in lines 21 and 22.

The term "spherical" has been re-introduced into (iii) as it was inadvertently removed in the last amendment.

Claims 3 and 4 have been deleted by this amendment. Claim 5 is the original claim 5. Claim 6 is supported by the sentence on page 2, lines 13-15. Similarly, claim 8 is supported by the sentence on page 2, lines 18 to 20. Claim 9 is a composite of claims 3 and 8 and is supported by the same portions of the specification that support claims 3

and 8. The remaining claims were present in the original application.

Yours truly

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per: Clifford W. Vermette

CWV/dbh

encl.

SWING BOOM PIVOT MECHANISM

FIELD

The present invention relates to an improved attachment arrangement for mounting a pivot base to the boom of a Swing Boom Assembly used on a skidder.

BACKGROUND OF THE INVENTION

Skidders are used in the forest industry to retrieve and load felled trees. Most consist of a prime mover, and a grapple attached to the end of a boom. Booms are typically mounted to the prime mover through a base allowing movement in a vertical plane. Side to side movement is accomplished through movement of the prime mover. Added maneuverability can be obtained by adding a pivoting base to which the boom is attached allowing the boom to swing about a vertical axis relative to the prime mover. This type of boom is commonly referred to as a Swing Boom Assembly.

The method of mounting the pivot to the base and boom becomes critical to prevent overloading of components. The boom assembly includes the boom, boom cylinder and grapple.

Referring to Figures **1-4**, a conventional method of attaching the main body **30** of a pivot base **22** to the boom assembly **32** of a swing boom **11** is shown. A horizontal pin **24** and boom cylinder **26** connect the boom **28** to the pivot base **22**. The extension of the boom cylinder **26** controls the amount of vertical motion of the boom **28**.

The pivot base **22** further comprises an upper spherical bearing **34**, ~~lower spherical bearing **36**, and a swivel actuator **38**~~. The upper spherical bearing **34**, ~~and lower spherical~~

~~bearing 36~~ permit the main body **30** of the pivot base **22** to rotate about a vertical axis relative to the fixed base **40**. ~~The swivel actuator 38 controls the amount of horizontal rotation of the pivot base 22 and boom 28 about the vertical axis.~~

As shown in Figure **1**, conventional designs incorporate an upper pivot shaft **42**, ~~and lower pivot shaft 44~~ rigidly attached to the main body **30** of the pivot base **22**. The upper pivot shaft **42** passes through the upper spherical bearing **34**, ~~and the lower pivot shaft 44 passes through the lower spherical bearing 36~~. The outer races of the upper ~~and lower~~ spherical bearing~~s~~ **34** ~~and 36 are~~ is rigidly attached to the fixed base **40**.

As best shown in Figures **2-4**, the upper pivot shaft **42** extends past the upper spherical bearing **34**. A clevis joint ~~46~~ **47** is used to connect the boom cylinder **26** to the upper pivot shaft **42**. The line of action of the boom cylinder **26** passes through the upper pivot shaft **42** above the upper spherical bearing **34** creating an overhung loading condition. Depending on the particular loading and position of the boom assembly **32** in the vertical plane, stresses due to the bending moment can become excessive, especially at the connection between the upper pivot shaft **42** and the main body **30** (see Figure **4**). As a result, the conventional method of attachment can lead to cracking and failure of the components comprising the vertical axis of the pivot base under severe operating conditions. As such, there is a need for an improved attachment method for mounting the pivot base to the boom assembly.

U.S. Patent No. 4,015,728 issued to Barker et al. discloses a yoke having upper and lower vertically spaced clevis arms at the top and at the bottom of the yoke. A boom is attached to the yoke at the bottom and a hydraulic piston-cylinder is attached between the boom and a top of the yoke. A shaft passes through the upper and lower sets of clevis arms and spherical bearings are located on the shaft intermediate the arms of each set of clevis arms. The outer raceway of the bearings is mounted to two arms affixed to the vehicle frame. A hydraulic actuator is positioned in the yoke between the sets of clevis plates and around the shaft. Such a system is normally used in circumstances such as in mounting a boom to the rear of a tracked vehicle. However, when mounting a boom on a fixed base or platform, a different mounting assembly is required.

SUMMARY

The present invention relates to a swing boom assembly, which has a fixed base, a pivot base rotatably mounted on the fixed base, and a boom pivotally coupled to the pivot base. The boom is coupled proximate a lower end of the pivot base and has a hydraulic piston cylinder coupled between the boom and an upper end of the pivot base. The hydraulic piston cylinder is operative to raise and lower the boom. The pivot base has an upper shaft, a main body having a pair of spaced apart clevis plates affixed to each end of the upper shaft, wherein the upper shaft is axially aligned with the lower pivot shaft. ~~and a~~ A spherical bearing is rigidly mounted around the upper shaft between the clevis plates and ~~said~~ the bearing having an outer race rigidly mounted to the fixed base.

The hydraulic piston cylinder may be pivotally coupled to the pivot base at a level intermediate the clevis plates.

The clevis plates are preferably integral with the main body.

BRIEF DESCRIPTION OF THE DRAWINGS

Further features and advantages of the invention will be apparent from the following detailed description, given by way of a preferred embodiment taken in conjunction with the accompanying drawings, wherein:

Figure 1 is a vertical sectional view through the middle of the prior art conventional pivot base upper connection;

Figure 2 is a perspective view of the prior art conventional pivot base upper connection;

Figure 3 is a side view of the prior art main body of the pivot base and conventional upper joint;

Figure 4 is a sectional view along line 1-1 of Figure **5A;**

Figure 5A is a perspective view of an improved Swing Boom Assembly in a neutral pivot position;

Figure 5B is a perspective view of an improved Swing Boom Assembly in a neutral pivot position;

Figure 6 is a vertical sectional view through the middle of the improved pivot base connection;

Figure 7is a perspective view of the improved pivot base connection.

Figure 8 is a side view of the main body of the pivot base and improved upper line; and

Figure 9 is a sectional view along line 2–2 of Figure 8

DETAILED DESCRIPTION

Referring to Figures **5A** and **5B** the movement of the main parts of a swing boom **13** are shown. A fixed base **52** is mounted rigidly to the prime mover (not shown). The boom assembly **60** is attached to the pivot base **46**. The boom assembly **60** includes the boom **59**, boom cylinder **58**, and grapple (not shown). The grapple attaches to the boom **59** at the grapple attachment point **16**. The pivot base **46** rotates from side to side as shown by double sided arrow **20** in Figure **5A**. The pivot base **46** is shown rotated counterclockwise in Figure **5B**. The extension of the boom cylinder **58** controls the amount of vertical motion of the boom **59**. The boom **59** may move in a horizontal plane with the movement of the pivot base **46** as shown by arrows **20**, as well as a vertical plane as illustrated by arrows **21** in Figure **5B**.

Referring to Figures **6-9**, an improved design for the attachment of the main body **54** of a pivot base **46** to the boom assembly **60** is mounted to the main body **54** of the pivot base **46**. The pivot base **46** is modified from the conventional method described in connection with Figures **2-5** at the upper pivot shaft **48**. Similar to the conventional method, the outer race of the upper spherical bearing **50** is rigidly mounted to the fixed base **52**. However, the main body **54** of the pivot base **46** is extended forming an integral clevis around the upper spherical bearing **50**, and both ends of the upper pivot shaft **48** are rigidly mounted to the main body **54** (see Figure **9**). Advantageously, the new geometry substantially reduces the bending moment on the upper pivot shaft **48** relative to the main body **54**, and resultant stresses in the upper pivot shaft **48**.

Referring to Fig. 6, the pivot base 46 is rigidly affixed to lower pivot shaft 44 and the latter is coupled to a lower spherical bearing 36 at its bottom the outer race of which is rigidly affixed to the fixed base 52. A pinion gear 62 is positioned around the lower pivot shaft 44 immediately above the lower spherical bearing 36. A pair of rack gears 64 engage the pinion gear 62 on either side thereof and, in response to hydraulic pistons, drive the pinion gear rotationally.

Accordingly, while this invention has been described with reference to illustrative embodiments, this description is not intended to be construed in a limiting sense. Various modifications of the illustrative embodiments, as well as other embodiments of the invention, will be apparent to persons skilled in the art upon reference to the description. It is therefore contemplated that the appended claims will cover any such modifications or embodiments as fall within the true scope of the invention.

WE CLAIM:

1. A swing boom assembly, comprising:

(a) a fixed base (52);

(b) a lower pivot shaft (44) rotatably mounted on said fixed base;

(c) a pivot base (46) mounted on said lower pivot shaft (44) at a lower end thereof a distance from said fixed base (52) sufficient only to clear said fixed base during rotation;

(d) a swivel actuator (38) coupled to said lower pivot shaft (44) and operative to drive said lower pivot shaft (44) in either of two rotational directions relative to said fixed base (52);

(e) a boom (14) pivotally coupled to said pivot base (46) proximate a lower end thereof and having a hydraulic piston cylinder (58) coupled between said boom (14) and an upper end of said pivot base (46) and operative to raise and lower said boom (14);

wherein said pivot base (46) has

(i) an upper shaft (48);

(ii) a main body (54) having a pair of spaced apart clevis plates affixed to each end of said upper shaft (48), wherein said upper shaft is axially aligned with said lower pivot shaft;

(iii)a spherical bearing (50) rigidly mounted around said upper shaft (48) between said clevis plates and said bearing having an outer race rigidly mounted to said fixed base (52).

2. An assembly according to claim 1, wherein said hydraulic piston cylinder (58) is pivotally coupled to said pivot base (46) at a level proximate said clevis plates.

~~3. An assembly according to claim 1, wherein said swivel actuator (38) includes a pinion gear (62) affixed to said lower pivot shaft (44) and a pair of rack gears (64) driven hydraulically on either side of said pinion gear (62).~~

~~4. An assembly according to claim 1, wherein said upper pivot shaft (48) is removable.~~

~~5~~3. An assembly according to claim 1, wherein said fixed base (52) is part of a skidder.

~~6~~4. An assembly according to claim 1, wherein said pivot base (46) is rigidly affixed to a distal portion of said lower pivot shaft (44).

~~7~~5. An assembly according to claim 1, wherein said clevis plates are integral with said main body (54).

~~8~~6. An assembly according to claim 1, including a lower bearing (52) coupled to a lower portion of said shaft and having an outer race rigidly coupled to said fixed base (52).

~~97~~. The assembly of claim 1, including a bearing coupled to a lower portion of said lower pivot shaft (44) with an outer race rigidly coupled to said fixed base and said pivot base is rigidly affixed to said lower pivot shaft (44).

ABSTRACT

The present invention relates to a swing boom assembly, which has a fixed base, a pivot base rotatably mounted on the fixed base, and a boom pivotally coupled to the pivot base. The boom is coupled proximate a lower end of the pivot base and has a hydraulic piston cylinder coupled between the boom and an upper end of the pivot base. The hydraulic piston cylinder is operative to raise and lower the boom. The pivot base has an upper shaft, a main body having a pair of spaced apart clevis plates affixed to each end of the upper shaft, and a spherical bearing rigidly mounted around the upper shaft between the clevis plates and said bearing having an outer race rigidly mounted to the fixed base. By coupling the hydraulic piston cylinder to the main body of the pivot base rather than directly to an upper shaft,